Notice No.9

Rules and Regulations for the Classification of Naval Ships, January 2018

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: November 2018

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Volume 2, Part 2, Chapter 1, Sections 2 & 8	1 January 2019	N/A
Volume 2, Part 3, Chapter 2, Section 4	1 January 2019	N/A
Volume 2, Part 7, Chapter 3, Sections 2 & 4	1 January 2019	N/A
Volume 2, Part 9, Chapter 3, Section 7	1 January 2019	N/A
Volume 2, Part 9, Chapter 5, Sections Scope & 4	1 January 2019	N/A
Volume 2, Part 9, Chapter 11, Sections Scope, 1 to 4	1 January 2019	N/A
Volume 2, Part 11, Chapter 2, Sections 2 & 3	1 January 2019	N/A
Volume 2, Part 11, Chapter 3, Section 5	1 January 2019	N/A
Volume 2, Part 12, Chapter 1, Section 9	1 January 2019	N/A

Lloyd's Register

Working together
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Volume 2, Part 2
Chapter 1
Reciprocating Internal Combustion Engines

■ *Section 2*
Materials and components

2.1 Crankshaft materials

Existing Table 1.2.1 has been deleted.

2.2 ~~Materials test and inspections~~ Testing and inspection

~~2.2.1 Materials and components for engines are to be manufactured, tested and certified as indicated in *Table 1.3.1 Test and certification requirements for engine components* and in accordance with the relevant requirements of the Rule for Materials.~~

~~2.2.2 *For components of novel design special consideration will be given to the acceptability of material properties and non-destructive testing requirements. For components and materials not specified in Table 1.2.1 Plans and particulars to be submitted, consideration will be given by LR upon submission and review of their full details.*~~

~~2.2.3 With reference to *Table 1.3.1 Test and certification requirements for engine components*, certification is to be in accordance with Rules for Materials, *Ch 1, 3.1 General* and with the type as specified in *Table 1.3.1 Test and certification requirements for engine components*.~~

~~2.2.4 The certificate is to be in accordance with the Rules for Materials, *Ch 1, 3.1 General 3.1.3* where the manufacturer or material supplier operates an approved LR Quality Scheme.~~

2.2.1 Materials and components for engines are to be manufactured, tested and documented in accordance with the relevant requirements of the *Rules for the Manufacture, Testing and Certification of Materials, July 2018* and *Table 1.2.1 Summary of testing and associated documentation for engine components*.

2.2.2 Where an LR quality scheme is in place (*see Pt 5, Ch 1, 1.3 Alternative approach for product assurance*), the testing and documentation requirements in *Table 1.2.1 Summary of testing and associated documentation for engine components* will be in accordance with a specific LR quality scheme certification schedule identifying the tests, intervention requirements and associated documentation including types of certificates that are to be issued.

2.2.3 The testing and inspection in *Table 1.2.1 Summary of testing and associated documentation for engine components* is to be documented by the manufacturer (e.g. manufacturer certified materials testing or manufacturer issued NDT report as applicable) except where LR intervention is explicitly required.

2.2.4 All material for components listed in *Table 1.2.1 Summary of testing and associated documentation for engine components* is to be from an LR approved manufacturer, and manufactured within the scope of approval of that manufacturer, except where explicitly stated otherwise in other Parts and Chapters of the Rules.

2.2.5 The manufacturer is not exempted from responsibility for any relevant tests and inspections of those parts for which documentation is not explicitly requested by LR.

2.2.6 Where *Table 1.2.1 Summary of testing and associated documentation for engine components* states that a test report is required, this is to be issued by the manufacturer and provided for review by the Surveyor. The report is to identify the samples from current production that have been tested and inspected to confirm that the component complies with all applicable requirements.

2.2.7 Where a manufacturer’s document (test certificate or NDT report) is required in *Table 1.2.1 Summary of testing and associated documentation for engine components*, this is to be issued by the manufacturer and provided for review by the Surveyor. The document is to comply with the requirements of the *Rules for the Manufacture, Testing and Certification of Materials, July 2018, Ch 1, 3.1 General 3.1.3(c)* or *Ch 1, 5.5 Non-destructive examination reports 5.5.1* as applicable.

2.2.8 Components and materials not specified in *Table 1.2.1 Summary of testing and associated documentation for engine components* or of novel design will be specially considered upon submission of their details.

Table 1.2.1 Summary of testing and associated documentation for engine components

Part	Material properties *see* Note 2	Non-destructive examination	Hydraulic testing *see* Note 4	Dimensional inspection *see* Note 3	Visual inspection	Applicable to engines	Final document to be issued
Welded bedplate	W (C + M)	W (UT + CD)	-	-	LR (V) fit-up + post-welding	All	LR Component Certificate
Bearing transverse girders (cast steel)	W (C + M)	W (UT + CD)	-	-	LR (V)	All	LR Component Certificate
Welded frame box *see* Note 5	W (C + M)	W (UT + CD)	-	-	LR (V) fit-up + post-welding	All	LR Component Certificate
Cylinder block (grey cast iron or spheroidal graphite cast iron)	-	-	W (P) *see* Note 6	-	-	Crosshead	W Hydraulic Test Certificate
Welded cylinder frames *see* Note 5	W (C + M)	W (UT + CD)	-	-	LR (V) fit-up + post-welding	Crosshead	LR Component Certificate
Engine block (grey cast iron)	-	-	W (P) *see* Note 6	-	-	>400W/cylinder	W Hydraulic Test Certificate
Engine block (spheroidal graphite cast iron)	W (M)		W (P) *see* Note 6			>400kW/cylinder	W Material Properties Certificate W Hydraulic Test Certificate
Cylinder liner	W (C + M)	-	W (P) *see* Note 6	-	-	B>300mm	W Material Properties Certificate W Hydraulic Test Certificate
Cylinder head (grey cast iron or spheroidal graphite cast iron)	-	-	W (P)	-	-	B>300mm	W Hydraulic Test Certificate
Cylinder head (cast steel)	W (C + M)	W (UT + CD)	W (P)	-	LR (V)	B>300mm	LR Component Certificate
Cylinder head (forged)	W (C + M)	W (UT + CD)	W (P)	-	LR (V)	B>300mm	LR Component Certificate
Piston crown (cast steel)	W (C + M)	W (UT + CD)	-	-	LR (V)	B>400mm	LR Component Certificate
Piston crown (forged)	W (C + M)	W (UT + CD)	-	-	LR (V)	B>400mm	LR Component Certificate
Crankshaft (one piece)	LR (C + M)	W (UT + CD)	-	W	LR (V) (Random, of fillets and oil bores)	All	LR Component Certificate
Semi-built crankshaft (crankthrow, forged main journal and journals with flange)	LR (C + M)	W (UT + CD)	-	W	LR (V) (Random, of fillets and shrink fittings)	All	LR Component Certificate
Exhaust gas valve cage	-	-	W (P)	-	-	Crosshead	W Hydraulic Test Certificate
Piston rod	LR (C + M)	W (UT + CD)	-	-	LR (V) (Random)	B>400mm	LR Component Certificate
Crosshead pin	LR (C + M)	W (UT + CD)	-	-	LR (V) (Random)	Crosshead	LR Component Certificate
Connecting rod with cap	LR (C + M)	W (UT + CD)	-	W	LR (V) (Random, of all surfaces in particular those shot peened)	All	LR Component Certificate

Crankshaft coupling bolts	LR (C + M)	W (UT + CD)	-	W	LR (V) (Random, of interference fit)	All	LR Component Certificate
Bolts and studs for cylinder heads, crossheads, main bearings and connecting rods *see* Note 9	W (C+ M)	W (UT + CD)	-	TR [thread making for connecting rods]	-	B>300mm	W Material Properties Certificate W Non-Destructive Examination Report W Test Report
Tie rod *see* Note 10	W (C+ M)	W (UT + CD)	-	TR [thread making]	LR (V) (Random)	Crosshead	LR Component Certificate
High pressure fuel injection system – valve and pump body (pressure side) *see* Notes 11 and 12	LR (C + M) *see* Note 8	-	W (Lesser of P or *p*+30 MPa)	-	-	B>300mm	LR Component Certificate *see* Note 8
			TR (Lesser of P or *p*+30 MPa)			B≤300mm	
High pressure fuel injection pipes including common rail *see* Note 11	LR (C + M) *see* Note 8	-	W (Lesser of P or *p*+30 MPa)	-	-	B>300mm	LR Component Certificate *see* Note 8
			TR (Lesser of P or *p*+30 MPa)			B≤300mm	
High pressure common servo oil system	LR (C + M) *see* Note 8	-	W (Lesser of P or *p*+30 MPa)	-	-	B>300mm	LR Component Certificate *see* Note 8
			TR (Lesser of P or *p*+30 MPa)			B≤300mm	
Coolers, both sides *see* Note 13	LR (C + M) *see* Note 8	-	W (P)	-	-	B>300mm	LR Component Certificate *see* Note 8
Accumulator of common rail fuel or servo oil system	LR (C + M) *see* Note 8	-	W (Lesser of P or *p*+30 MPa)	-	-	Accumulators with a capacity >0,5l	LR Component Certificate *see* Note 8
Piping, pumps, actuators, etc., for hydraulic drive of valves, if applicable	LR (C + M) *see* Note 8	-	W (P)	-	-	>800kW/cylinder	LR Component Certificate *see* Note 8
Engine-driven pumps (oil, water, fuel, bilge)	LR (C + M) *see* Note 8	-	W (P)	-	-	>800kW/cylinder	LR Component Certificate *see* Note 8
Bearings (main, crosshead, and crankpin) *see* Note 14	TR [C]	TR [UT]	-	W	-	>800kW/cylinder	TR Material Properties TR Non-Destructive Examination Report W Inspection Certificate

<table>
<tr><td colspan="2">SYMBOLS:</td></tr>
<tr><td>B = Bore dimension, refers to engine cylinder bores</td><td>*p* = Maximum working pressure of item concerned</td></tr>
<tr><td>C = Chemical composition analysis</td><td>P = Pressure test at 1,5*p*</td></tr>
<tr><td>M = Mechanical property analysis</td><td>V = Visual examination of accessible surfaces</td></tr>
<tr><td>UT = Ultrasonic testing (*see* Note 1)</td><td>LR ( ) = Test/inspection to be certified by LR</td></tr>
<tr><td>CD = Crack detection by MPI or DPT (*see* Note 7)</td><td rowspan="2">TR [ ] = Test report required for process in brackets (*see Pt 5, Ch 2, 2.2 Testing and inspection 2.2.6*)</td></tr>
<tr><td>W ( ) = Test/inspection to be certified by manufacturer</td></tr>
<tr><td colspan="2">Note 1. Ultrasonic testing is not required for components manufactured from cast iron.</td></tr>
<tr><td colspan="2">Note 2. Material properties include chemical composition and mechanical properties, as identified in the table above. Where mechanical testing is required this is to include testing of surface treatment, such as surface hardening (hardness, depth and extent), peening and rolling (extent and applied force) as applicable. Mechanical tests are to be conducted after the final heat treatment has been applied.</td></tr>
<tr><td colspan="2">Note 3. Dimensional inspection, including assessment of surface condition.</td></tr>
<tr><td colspan="2">Note 4. Hydraulic testing is applied on the water/oil side of the component. The full lengths of cooling spaces are to be tested, where applicable. Where design or testing features may require modification of these test requirements, special consideration may be given.</td></tr>
<tr><td colspan="2">Note 5. Where welding is carried out, welding and welder qualifications are to be carried out in accordance with the *Rules for the Manufacture, Testing and Certification of Materials, July 2018, Ch 12 Welding Qualifications*.</td></tr>
<tr><td colspan="2">Note 6. Hydraulic testing is also required for those parts filled with cooling water and having the function of containing the water which is in contact with the cylinder or cylinder liner.</td></tr>
<tr><td colspan="2">Note 7. Magnetic particle testing is to be carried out on ferromagnetic materials, penetrant testing is only to be carried out on non-ferritic materials. Visual examination alone is considered insufficient. Magnetic particle and dye penetrant testing are to be carried out when the forgings are in the finished machined condition.</td></tr>
<tr><td colspan="2">Note 8. Where piping systems and components are categorised as Class III, the testing for material properties shall be W (C + M) as a minimum. For materials documentation requirements, *see Pt 7, Ch 1, 4 Materials.* W Hydraulic Test Certificate or Test Report will also form as part of Final Document to be Issued.</td></tr>
<tr><td colspan="2">Note 9. *See also Rules for the Manufacture, Testing and Certification of Materials, July 2018, Ch 5, 3.5 Non-destructive examination 3.5.1* for detailed non-destructive examination requirements for other bolts and studs.</td></tr>
<tr><td colspan="2">Note 10. Magnetic particle testing of tie rods may be confined to the threaded portions and the adjacent material over a length equal to that of the thread.</td></tr>
<tr><td colspan="2">Note 11. Where components are subjected to an autofrettage process accepted by LR (*see Pt 2, Ch 1, 3.5 Autofrettage*), the component pressure test may be omitted. The assembled system containing such components is to be shown, where practicable, to be pressure-tight as required for hydraulic systems.</td></tr>
<tr><td colspan="2">Note 12. Pumps used in jerk or timed pump systems only need to have the assembled high pressure containing components hydraulically tested.</td></tr>
<tr><td colspan="2">Note 13. Material and component certification for accumulators or coolers which are classed as pressure vessels are dependent on the operating pressure and temperature, *see Pt 8, Ch 2, 1.5 Classification of fusion welded pressure vessels* and *Pt 8, Ch 2, 1.7 Materials*. Charge air coolers are only to be tested on the water side.</td></tr>
<tr><td colspan="2">Note 14. Ultrasonic testing is required to prove full adhesion between base material and bearing metal.</td></tr>
</table>

■ *Section 8*
Piping

~~8.6 Fuel oil filters and fittings~~

~~8.6.1 Two or more filters are to be fitted in the fuel oil supply lines to the main and auxiliary engines, and the arrangements are to be such that any filter can be cleaned without interrupting the supply of filtered fuel oil to the engines.~~

~~8.6.2 Drip trays are to be fitted under fuel oil filters and other fittings which are required to be opened up frequently for cleaning or adjustment or where there is the possibility of leakage. Alternative arrangements may be acceptable and full details should be submitted for consideration.~~

Existing sub-Sections 8.7 to 8.8 have been renumbered 8.6 to 8.7.

Volume 2, Part 3, Chapter 2
Shafting Systems

■ *Section 4*
Design and construction

4.20 Shaft seals in watertight bulkheads

4.20.1 Where a shaft seal is included in a watertight bulkhead, the design is to be capable of incorporating the maximum bulkhead deflection limits in the axial and radial directions as defined in *Vol 1, Pt 6, Ch 3, Section 4 NS2 and NS3 scantling determination*.

4.20.2 When the design of the shaft seal is not able to incorporate the stated bulkhead deflection limits described in *Vol 2, Pt 3, Ch 2,4.20 Shaft seals in watertight bulkheads 4.20.1,* then the bulkhead design as per *Vol 1, Pt 6, Ch 3, 9.1 General 9.1.9* is to be considered.

Volume 2, Part 7, Chapter 3
Machinery and Piping Systems

■ *Section 2*
Fuel oil – General requirements

2.9 Precautions against fire

2.9.9 Drip trays are to be fitted at the furnace mouths to intercept oil escaping from the burners, and under all other fuel oil appliances such as fuel oil filters, which are required to be opened up frequently for cleaning or adjustment. Alternative arrangements may be acceptable and full details should be submitted for consideration.

■ *Section 4*
Fuel oil pumps, pipes, fittings, tanks, etc.

4.16 Fuel oil supply to main and auxiliary engines

4.16.1 Two or more filters are to be fitted in the fuel oil supply lines to the main and auxiliary engines, and the arrangements are to be such that any filter can be cleaned without interrupting the supply of filtered fuel oil to the engines.

Existing sub-Sections 4.16 to 4.19 have been renumbered 4.17 to 4.20.

Volume 2, Part 9,
Chapter 3
Electrical Power Distribution and Equipment

■ *Section 7*
Converter equipment

7.1 Transformers

7.1.11 When oil-immersed transformers are used, there is to be monitoring for low oil level with an alarm when pre-set limits are crossed. There are to be arrangements so that the load may be reduced to a level commensurate with the cooling available.

Existing paragraphs 7.1.11 to 7.1.13 have been renumbered 7.1.12 to 7.1.14.

Volume 2, Part 9,
Chapter 5
Hazardous Areas

■
Scope

This Chapter details the requirements for installations and equipment selection to minimise the risk of ignition of explosive gas or dust atmospheres.

Application of this Chapter will facilitate the verification of the performance requirements of ANEP-77 NATO Naval Ship Code, Chapter IV, Regulation ~~18~~ 21 (in conjunction with *Vol 2, Pt 9, Ch 11 Gas Detection*).

■ *Section 4*
Electrical equipment for use in explosive gas atmospheres or in the presence of combustible dusts

4.1 General

4.1.8 Hazardous areas shall be fitted with a gas detection system in accordance with *Vol 2, Pt 9, Ch 11 Gas Detection*.

Volume 2, Part 9,
Chapter 11
Gas Detection

Existing Chapter 11 has been renumbered Chapter 12.

■
Scope

The requirements of this Chapter are applicable to the design and construction philosophy for the Gas Detection systems.

This Chapter details the requirements for gas detection systems to detect flammable, poisonous, toxic/corrosive, asphyxiant or irritant gases and alert personnel to enable the hazard to be managed.

Application of this Chapter will facilitate the verification of the performance requirements of ANEP-77 NATO Naval Ship Code, Chapter IV, Regulation 21 (in conjunction with *Vol 2, Pt 9, Ch 5 Hazardous Areas*).

■ *Section 1*
Functional requirements

1.1 Functional requirements

1.1.1 The design, selection and installation of gas detection systems shall detect flammable, poisonous, toxic/corrosive and irritant gases to enable the risks to personnel and the ship to be managed.

■ *Section 2*
Performance requirements

2.1 Performance requirements

2.1.1 Spaces which are identified as potentially containing flammable, poisonous, toxic/corrosive, asphyxiant or irritant gases shall be fitted with a gas detection system.

2.1.2 Gas detection systems shall not introduce additional hazards.

2.1.3 Suitable indication of the nature of the potential hazards shall be provided at the entrance(s) to the space, and on the equipment where applicable.

■ *Section 3*
Verification requirements

3.1 General

3.1.1 Compliance with the requirements in *Vol 2, Pt 9, Ch 11, 4 Gas Detection* is deemed to satisfy the functional requirements and performance requirements above.

3.1.2 Where a designer offers a novel solution, or the solution is non-compliant with the requirements of this Chapter, an engineering safety and justification report is to be submitted. The engineering safety and justification report is to demonstrate how the proposed solution will satisfy the functional requirements and performance requirements in *Vol 2, Pt 9, Ch 11, 1 Functional requirements* and *Vol 2, Pt 9, Ch 11, 2 Performance requirements*.

3.1.3 The Naval Administration may impose requirements additional to those in this Chapter.

■ *Section 4*
Gas Detection

4.1 General

4.1.1 An efficient gas detection system, suitable for the gases and/or vapours anticipated, is to be provided for all spaces which are identified as potentially containing flammable, poisonous, toxic/corrosive, asphyxiant or irritant gases in concentrations which may exceed a predetermined hazardous limit during normal operation or in the event of a reasonably foreseeable failure. Where the potential for oxygen depletion is also identified, the measurement of oxygen levels in the spaces may also be required.

4.1.2 Spaces where a gas detection system may be required include but are not limited to:
(a) low flashpoint fuel storage and handling spaces;
(b) waste oil and oily water handling areas;
(c) spaces containing emissions abatement equipment;
(d) refrigeration plant rooms;
(e) sewage treatment plant rooms;
(f) waste treatment and storage rooms;
(g) chemical storage areas;
(h) compressed gas storage areas;
(i) energy storage system compartments.

4.2 Design and construction

4.2.1 Gas detection equipment is to be designed, installed and tested in accordance with a relevant International or National Standard acceptable to Lloyd’s Register (hereinafter referred to as ‘LR’).

4.2.2 Gas detection equipment is to consist of a permanently fixed installation and at least two sets of portable equipment suitable for the chemical compositions anticipated.

4.2.3 Fixed gas detection systems are to comply with *Vol 2, Pt 9, Ch7, 4.3 Alarm systems, general requirements* and where they are also capable of automatically activating safety shutdown functions are to comply with *Vol 2, Pt 9, Ch 8, 5 Programmable electronic systems (PES)*.

4.2.4 The position and number of sampling points is to be determined with due regard to the density of the gases and/or vapours of the substances anticipated, and the dilution resulting from compartment ventilation. In each case, a sufficient number of sampling points is to be provided to give efficient sampling to maintain a safe environment. Common sampling lines to the detection equipment are not to be fitted.

4.2.5 Gas analysing units may be located outside the spaces served provided that:

(a) sampling lines do not pass through ‘gas-safe’ spaces, except where permitted by *Vol 2, Pt 9, Ch 11, 4.2 Design and Construction 4.2.5(f)*;
(b) the gas sampling pipes serving spaces potentially containing flammable gasses are to be fitted with flame arresters;
(c) sample gas is to be led to the atmosphere with outlets arranged in a safe location, in the open atmosphere;
(d) bulkhead penetrations of sample pipes between safe and dangerous areas are of an approved type. A manual isolating valve is to be fitted in each of the sampling lines at the bulkhead in the safe area;
(e) the gas detection equipment including sampling piping, sampling pumps, solenoid valves and analysing units, are located in a fully enclosed steel cabinet, with a gasketed door, monitored by its own sampling point. At gas concentrations above a predetermined limit inside the steel cabinet, the entire gas-analysing unit is to be automatically shut-down; and
(f) sample pipes passing through gas safe spaces are to be of steel or other equivalent material and without detachable piping connections, except for the connection points for isolating valves at the bulkhead and analysing units. The sample pipes are to be led by their shortest route.

4.2.6 Where continuous sampling is not required, the gas detection equipment is to be capable of sampling and analysing from each sampling point within a single space at agreed intervals, which are in no case to exceed 30 minutes.

4.2.7 Fixed gas detection systems are to provide indication of gas concentration levels and give audible and visible alarms when these exceed a predetermined limit, both at a continually attended control station and within the space, or adjacent to the access for normally unoccupied spaces.

4.2.8 Gas concentration alarm limits are to be selected in accordance with an appropriate national or international standard.

4.2.9 The gas detection equipment is to be designed so that it may be readily and regularly tested and calibrated. Suitable equipment and span gas is to be provided for this purpose. In addition, regular checking procedures with portable equipment are to be provided, particularly for closed or unmanned spaces. Permanent connections for such test equipment shall be fitted.

4.2.10 Where fixed equipment for detecting the specific flammable, poisonous, toxic/corrosive, asphyxiant or irritant gases which may be present in the space cannot be provided, full details of alternative arrangements and an engineering safety and justification report in accordance with *Vol 2, Pt 9, Ch 11, 3.1 General 3.1.2* are to be submitted.

4.3 Installation

4.3.1 The gas detection system is to be examined and tested to ensure that it has been installed in compliance with its certification, and that the integrity of boundaries has been maintained.

4.3.2 Alerts and indicators associated with the gas detection system are to be tested for correct operation.

4.3.3 Spaces which are identified as potentially containing flammable, poisonous, toxic/corrosive, asphyxiant or irritant gases shall be marked to alert those entering to the nature of the potential hazards. Where applicable, the equipment which will potentially release such gasses is also to be marked.

Volume 2, Part 11,
Chapter 2
Heating, Ventilation and Cooling Arrangements

■ *Section 2* Construction and installation

2.4 Refrigerant systems for cooling

2.4.2 The compartments containing the refrigeration plants are to be provided with refrigerant gas detectors in accordance with *Vol 2, Pt 9, Ch 11 Gas Detection* with audible and visual alarms.

■ *Section 3* System arrangements

3.1 General

(Part only shown)

3.1.2 The design and capability of supply and exhaust systems for ventilation purposes are to address the following requirements as applicable:

(b) Acceptable levels of fresh air are to be provided for personnel efficiency, combustion or other oxidation processes. The arrangements are to ensure that maximum CO_2 levels are not exceeded in all spaces where crew and embarked personnel are likely to be.

  (i) a maximum CO_2 level of 1200 ppm is to be adopted. A ~~high level alarm~~ gas detection system in accordance with *Vol 2, Pt 9, Ch 11 Gas Detection* is to be provided where 100 per cent recirculation is adopted for any ship operational requirement.

Volume 2, Part 11,
Chapter 3
Waste Systems

■ *Section 5* Control and monitoring and electrical power arrangements

5.1 General

5.1.8 Spaces containing waste storage or handling systems potentially containing flammable, poisonous, toxic/corrosive, asphyxiant or irritant gases shall be fitted with a gas detection system in accordance with *Vol 2, Pt 9, Ch 11 Gas Detection*.

Volume 2, Part 12,
Chapter 1
Emissions Abatement Plant for Combustion Machinery

■ *Section 9* Electrical and control equipment

9.1 General

9.1.4 Where flammable or toxic chemicals, gases or vapours are present, as identified in *Vol 2, Pt 12, Ch 1, 3.3 Chemical substances 3.3.1* and *Vol 2, Pt 12, Ch 1, 3.3 Chemical substances 3.3.2*, or where there is a possibility that flammable gases and vapours can be produced as a result of deviations from normal operation, the defining of hazardous zones is to be in accordance with *Vol 2, Pt 9, Ch 5, 4 Electrical equipment for use in explosive gas atmospheres or in the presence of combustible dusts*.

As a minimum, for the detection of gas and vapours, a gas detection system in accordance with *Vol 2, Pt 9, Ch 11 Gas Detection* is to be fitted which is to activate at a concentration corresponding to the substance safe occupational level. The locations of the detectors are to be determined relative to the layouts of the individual spaces and are to be indicated on the plan submission required by *Vol 2, Pt 12, Ch 1, 3.3 Chemical substances 3.3.9*. Where it is not practicable to install a detection system, alternative proposals are to be submitted to ensure the safety of persons from exposure to such substances.

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